

## LIMITING REAGENT LAB EXPERIMENT

### Objectives:

1. To prepare two solutions and use them to perform a precipitate reaction.
2. To determine which reagent limits the reaction.
3. To calculate the percentage yield of this reaction.

### Procedure:

1. Obtain the mass of a dry piece of filter paper.
2. Prepare two solutions – one of calcium nitrate and one of sodium carbonate.
  - a. Measure 0.50g  $\text{Na}_2\text{CO}_3$  in a clean, dry 100-mL beaker. Add exactly 10.00ml of distilled water to the beaker using a 10.00 or 25.00-mL graduated cylinder.
  - b. Measure 1.00g  $\text{Ca}(\text{NO}_3)_2$  in a clean, dry 100-mL beaker. Add exactly 10.00 ml of distilled water to the beaker, using a graduated cylinder to measure the volume of water.
3. Pour one beaker into the other along a stirring rod and stir the mixture. Record all observations.
4. After complete mixing, set up a filter/funnel. Use 12.5 cm size filter paper, fold as instructed, and initial in pencil on the outside after folding. Place the filter paper in the funnel and wet the sides with distilled water. Filter the mixture through the funnel.
5. Continue passing solution through the funnel until the liquid in the solution becomes clear. This may require you to rinse the reaction beaker with distilled water several times. Filtration may require more than 10 minutes to complete.
6. Place the filter paper in the oven until dry (15 minutes). Record the mass of the filter paper and solid. Discard the filter paper/solid in the trash can.

### Data:

a	Mass $\text{Na}_2\text{CO}_3$	
b	Mass $\text{Ca}(\text{NO}_3)_2$	
c	Mass $\text{CaCO}_3$ precipitate & filter paper	
d	Mass of filter paper	
e	Calculated mass of $\text{CaCO}_3$ precipitate (c-d)	

**Calculations:**

1. Write a balanced chemical equation for the reaction including phases.
2. Determine the limiting reagent and the expected quantity of product produced from the masses of the starting materials.
3. Determine the percentage yield of this reaction.

**Questions:**

1. Determine the mole ratio of limiting reagent to precipitate based on your experimental data. How does it compare to the ratio given in the balanced chemical equation?
2. State the value of your percentage yield, and discuss possible reasons (at least 3) why it may be different from the expected (theoretical) yield.
3. What type of reaction occurred during this experiment? \_\_\_\_\_
4. If the mass of  $\text{Na}_2\text{CO}_3$  was doubled and the mass of  $\text{CaCO}_3$  was held constant, would you have the same limiting reactant? Show calculations to support your answer.